Chemical & Engineering NEWS

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C&EN's Top 50 Chemical Products & Processes

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C&EN's Top 50 Chemical Products & Producers

It is becoming a familiar dirge that the recession which began to grip the U.S. chemical industry in 1980 just will not let go, easing as it did through some of 1981 and then renewing its hold.

The result is that the persistent downturn has stopped growth completely in many segments of the chemical industry and is effectively stalling the industry at 1979 levels. This is readily apparent in C&EN's survey of the Top 50 products and the Top 50 producers on the following pages.

For instance, chemical poundage in the 50 largest-volume products slipped 2% in 1981 after a 1% decline in 1980. Chemical production volume never has fallen two years in a row in modern times.

The 1981 decline was led by inorganic chemicals, especially those related to fertilizers. Organics roughly stabilized after losing ground the year before. Specifically, inorganic production dropped 2.9% in 1981 after gaining 2.5% in 1980. Organic output, saved by relatively good performance in downstream polymers, dropped less than 1% after falling 6.9% in 1980.

Because output of fewer organic chemicals fell in 1981, there were fewer total declines among the Top 50 products. In 1980, output of 40 chemicals declined; in 1981, output of just 27 dropped. Last year, 14 of those declining were organics, whereas in 1980, 27 were organics. The number of falling inorganics remained constant for both years at 13; however, the roster of declining inorganics changed.

As a result of falling production volume, the only way that chemical producers could increase their dollar sales last year was to raise prices. According to government figures, prices for chemicals and allied products increased more than 10% in 1981. And total dollar sales of chemicals among the Top 50 chemical producers increased 7.6% from 1980.

However, even raising prices could not stem the drain of increased costs on profits. Chemical operating profits among the 50 producers fell 8.4% from 1980. The result was that operating profit margins for the chemical producers dropped to an average 7.7% in 1981 from 9.0% in 1980, and return on chemical assets dropped to 8.4% from 11.5%.

The outlook for 1982 is no better and possibly worse, to judge from the industry's miserable first quarter. Sales in 1982 probably will be up a little, but not so much as in 1981. Earnings undoubtedly will fall.

And although some chemical company executives are beginning to turn optimistic, there is very little evidence thus far that demand is heading into any sustained healthy new expansion.

Big-volume chemicals' output fell again in '81

Patricia L. Layman
C&EN, New York

C&EN's Top 50 Chemical Products

Last year showed what can happen, even in a traditional growth industry like chemicals, if recessions come too often or last too long. Not long after U.S. chemical producers breathed a sigh of relief that they had not been hit too hard in the 1980 recession, an even worse downturn hit toward the end of 1981.

From a big-product point of view, the main effect of the new recession was to spread the damage from organics, already suffering from 1980, to the inorganics. The result in 1981 statistics is that organics remained about where they were while inorganics dropped hard.

For C&EN's Top 50 chemical products, overall production in 1981 fell another 2% after a 1% dip in 1980. These percentages may seem small, but their meaning is momentous. The modern U.S. chemical industry never before has had back-to-back years of falling production. In fact, the industry's management always has been predicated on growth. The sustained pause in physical volume since 1979 has thrown previous strategy out the window.

In the specific product-by-product performance charted in the Top 50, proliferating minus signs for chemicals' 1980 production gave a combined 0.6% loss from 1979. This happened mainly because inorganics, which accounted for 68% of the total, were able to ride out the year with a 2.5% increase in production.

But 1981 caught up with inorganics. Their output slipped 2.9%, dragging the Top 50 as a whole down 2.2%, from about 560 billion lb (revised estimate) in 1980 to almost 548 billion lb in 1981. Organics production also slipped in 1981 but by much less than the year before, less than 1%, to about 175 billion lb.

For the Top 50 as a whole, drops in 1981 production were fewer, and, in general, less severe than in 1980. And the pattern of declines shifted. In 1980, 40 chemicals' output dropped, 27 of them organics. The 1981 declines, however, hit only 27 chemicals, but 13 were inorganic and 14 organic. In fact, organics led in output increases in 1981.

Most of the big (more than 10%) 1981 boosts in production blessed organics—urea, methanol, and toluene. The other major increase was in calcium chloride. In 1980, only two chemicals, nitrogen and ammonium nitrate, showed more than 10% growth over the year before.

Bad health in specific end uses cast a pall on several chemicals. For ex-

About the Top 50 list of chemical products

Government data, trade association figures, industry estimates. All of these go into preparing C&EN's annual list of the Top 50 chemical products, ranked by production volume. The federal government is relied upon most heavily, but when government figures are not available, other sources, primarily trade associations, are used. Industry sources and C&EN estimates are used only when other data are lacking or incomplete.

Government data are not always accurate—they are only as good as the information that individual companies report. But they are an objective measure of production extending back for many years. Therefore, relatively accurate indications of growth can be made on a consistent basis.

At this time of year, C&EN has access only to preliminary reports of production for 1981. When the government and trade associations issue their final reports, the outcome can be changed, sometimes dramatically. As a result, production figures for 1980 that appear in the table on page 11 may be different from those published at this time last year. The final reports also can affect the rankings of chemicals. The 1980 rankings of 29 of the chemicals listed in the table, for example, are different from those in the similar table published by C&EN a year ago.

The list itself covers production figures for the U.S., and includes chemicals produced for export. Candidates for the list include all basic, intermediate, chemically homogeneous finished products. These range from chemical building blocks such as ethylene and propylene to finished products such as vinyl acetate and ethylene glycol.

The roster also includes basic inorganic chemicals, but does not include what C&EN considers to be minerals, such as salt, potash, gypsum, and sulfur. Lime is included because it is processed and has many chemical and industrial applications. Refractory (dead-burned) dolomite is excluded in the calculations of lime production.

In the organics, such petrochemical feedstocks as ethane, butane, and propane are excluded arbitrarily, because they are considered to be products of oil companies and because they have many nonchemical uses.

There are other gray areas besides lime and petrochemical feedstocks. For example, the basic aromatics—benzene, toluene, and xylene—are included. Admittedly, this makes the list less pure chemically. Mixed xylenes and the para isomer are on the list. If production volume had warranted, the ortho isomer also would have been included.

Production figures are published by the government and trade associations in a variety of units—millions of pounds, thousands of tons, billions of cubic feet, millions of gallons, metric tons. To provide an accurate ranking and to make comparison of production volumes easier, C&EN not only gives production in common units but converts production to billions of pounds.

The Top 50 list, in addition to listing production figures for the past two years, indicates growth rates for the past year, the previous year, the past five years, and the past 10 years, giving the reader a historical perspective on growth for each chemical.

Inorganic chemicals' drop led Top 50 to 2.2% production decline in 1981

Rank 1981	Rank 1980[a]		Production: Billions of lb 1981	Billions of lb 1980	Common units[b] 1981	Common units[b] 1980	Average annual change 1980–81	1979–80	1976–81	1971–81
1	1	Sulfuric acid	81.35	88.54	40,674 tt	44,272 tt	−8.1%	5.4%	3.1%	3.4%
2	2	Ammonia	38.07	38.09	19,037 tt	19,044 tt	−0.1	5.1	2.6	2.7
3	5	Nitrogen	37.31	34.71	485 bcf	479 bcf	1.3	16.0	11.0	11.2
4	4	Lime[c]	35.99	35.36	17,969 tt	17,680 tt	1.6	−8.8	−1.2	−0.4
5	3	Oxygen	34.93	35.68	422 bcf	431 bcf	−2.1	0.9	1.7	2.9
6	6	Ethylene	28.87	28.67	28,867 mp	28,667 mp	0.7	−4.1	5.6	4.6
7	7	Sodium hydroxide	21.30	23.25	10,649 tt	11,625 tt	−8.4	−6.2	0.3	1.0
8	8	Chlorine	21.12	22.84	10,559 tt	11,421 tt	−7.5	−5.7	0.3	1.2
9	9	Phosphoric acid	19.83	21.88	9,914 tt	10,938 tt	−9.3	7.9	4.5	5.2
10	11	Nitric acid	18.08	17.47	9,040 tt	8,733 tt	3.5	2.0	3.0	1.7
11	10	Ammonium nitrate[d]	17.58	18.25	8,791 tt	9,127 tt	−3.7	17.0	4.1	2.8
12	12	Sodium carbonate[e]	16.56	16.55	8,281 tt	8,275 tt	0.1	0.3	1.8	1.5
13	15	Urea[f]	14.97	12.96	14,970 mp	12,960 mp	15.5	−8.7	8.9	8.1
14	14	Propylene	14.02	13.68	14,016 mp	13,676 mp	2.5	−3.7	7.5	7.4
15	19	Toluene[g]	10.32	7.37	1,424 mg	1,017 mg	40.0	−38.0	4.6	5.0
16	13	Benzene	9.91	14.75	1,348 mg	2,007 mg	−33.0	20.0	−1.4	2.3
17	16	Ethylene dichloride	9.17	11.11	9,171 mp	11,108 mp	−17.4	−5.9	3.0	2.0
18	20	Methanol	8.41	7.15	8,408 mp	7,153 mp	17.8	−2.9	6.1	5.5
19	18	Carbon dioxide[h]	7.96	7.44	3,982 tt	3,720 tt	7.0	5.3	14.1	11.5
20	17	Ethylbenzene	7.85	7.64	7,847 mp	7,642 mp	2.7	−10.0	5.1	4.7
21	23	Vinyl chloride	6.72	6.47	6,720 mp	6,466 mp	3.9	1.2	3.2	4.5
22	21	Styrene	6.61	6.86	6,612 mp	6,856 mp	−3.6	−8.4	1.0	3.5
23	22	Xylene	6.43	6.59	887 mg	909 mg	−2.5	−4.3	−2.6	3.8
24	24	Terephthalic acid[i]	6.35	6.05	6,350 mp	6,054 mp	4.9	−1.7	4.7	10.6
25	26	Formaldehyde[j]	5.86	5.56	5,855 mp	5,555 mp	5.4	−6.9	0.8	2.6
26	27	Ethylene oxide	5.11	5.22	5,109 mp	5,220 mp	−2.1	−7.9	2.1	3.6
27	25	Hydrochloric acid	4.89	5.79	2,443 tt	2,895 tt	−15.6	−2.2	−0.6	1.5
28	29	Ammonium sulfate	4.22	4.27	2,111 tt	2,136 tt	−1.2	8.4	0.5	1.5
29	28	Ethylene glycol	4.06	4.39	4,055 mp	4,386 mp	−7.5	−7.3	3.8	2.8
30	30	*p*-Xylene	3.70	4.24	3,696 mp	4,238 mp	−12.8	−8.9	2.9	8.3
31	31	Cumene	3.31	3.46	3,306 mp	3,459 mp	−4.4	−11.7	4.2	4.4
32	33	Butadiene[k]	3.05	2.80	3,046 mp	2,799 mp	8.8	−21.9	−2.9	−0.7
33	36	Carbon black	2.73	2.55	2,730 mp	2,546 mp	7.2	−24.0	−2.0	−1.0
34	32	Acetic acid	2.71	2.98	2,706 mp	2,977 mp	−9.1	−8.8	2.2	3.3
35	35	Phenol[l]	2.55	2.57	2,551 mp	2,568 mp	−0.7	−13.9	3.1	3.9
36	34	Aluminum sulfate	2.41	2.57	1,206 tt	1,286 tt	−6.2	4.4	0.3	0.7
37	37	Sodium sulfate[m]	2.33	2.28	1,164 tt	1,139 tt	2.2	−2.9	−1.1	−1.5
38	38	Acetone	2.17	2.08	2,167 mp	2,076 mp	4.4	−21.7	2.3	3.5
39	42	Acrylonitrile	2.01	1.83	2,006 mp	1,830 mp	9.6	−9.3	5.8	7.4
40	40	Vinyl acetate	1.93	1.92	1,934 mp	1,922 mp	0.6	−3.0	5.5	7.6
41	44	Calcium chloride[n]	1.83	1.62	917 tt	811 tt	13.1	−17.3	0.5	−2.8
42	43	Propylene oxide	1.81	1.77	1,810 mp	1,767 mp	2.4	−21.4	0.8	4.3
43	39	Cyclohexane	1.75	1.96	1,749 mp	1,964 mp	−10.9	−19.0	−4.3	0.1
44	41	Isopropyl alcohol	1.64	1.84	1,644 mp	1,836 mp	−10.5	−3.4	−0.9	−0.4
45	46	Titanium dioxide	1.50	1.57	750 tt	787 tt	−4.7	6.2	1.0	1.0
46	47	Sodium silicate	1.48	1.57	738 tt	785 tt	−6.0	1.0	−0.3	1.5
47	45	Sodium tripolyphosphate	1.37	1.58	687 tt	789 tt	−12.9	4.4	−1.1	−4.0
48	48	Acetic anhydride	1.25	1.47	1,248 mp	1,468 mp	−15.0	−2.5	−3.7	−1.9
49	50	Adipic acid	1.21	1.20	1,210 mp	1,200 mp	0.8	−33.3	−4.4	−0.8
50	49	Ethanol[j]	1.16	1.45	1,157 mp	1,451 mp	−20.3	3.1	−0.4	−3.4
		TOTAL ORGANICS IN TOP 50	**174.91**	**176.04**			**−0.6%**	**−6.9%**	**3.8%**	**4.5%**
		TOTAL INORGANICS IN TOP 50	**372.84**	**383.86**			**−2.9%**	**2.5%**	**2.8%**	**2.8%**
		GRAND TOTAL OF TOP 50	**547.75**	**559.90**			**−2.2%**	**−0.6%**	**1.6%**	**3.4%**

a Revised. **b** tt = thousands of tons, bcf = billions of cubic feet, mp = millions of pounds, mg = millions of gallons. **c** Except refractory dolomite. **d** Original solution. **e** Synthetic and natural. **f** Primary solution. **g** All grades. **h** All forms. **i** Includes both acid and ester without double counting. **j** 37% by weight. **k** Rubber grade. **l** Synthetic only. **m** High and low purity. **n** Solid and liquid.
Sources: Bureau of the Census, Bureau of Mines, International Trade Commission, C&EN estimates

Polymer recovery in 1981 was led by synthetic fibers

Production	Billions of lb		Common units					Average annual growth			
	1981	1980	1981	1980	1979	1976	1971	1980–81	1979–80	1976–81	1971–81
PLASTICS (millions of lb)											
Thermosetting resins	**4.18**	**4.52**	**4,174**	**4,517**	**4,856**	**3,633**	**2,897**	**−7.6%**	**−7.0%**	**2.8%**	**3.7%**
Phenolic and other tar acid resins	1.49	1.75	1,489	1,745	1,781	1,340	1,194	−14.7	−2.0	2.2	2.2
Urea resins	1.17	1.31	1,167	1,311	1,367	821	636	−11.0	−4.1	7.3	4.8
Polyesters (unsaturated)	1.00	0.95	996	952	1,147	1,042	730	4.6	−17.0	−0.9	3.2
Epoxies (unmodified)	0.34	0.32	341	323	361	244	169	5.6	−10.5	6.9	7.2
Melamine resins	0.18	0.19	181	186	200	186	168	−2.7	−9.5	−0.5	0.7
Thermoplastic resins	**27.30**	**26.45**	**27,296**	**26,444**	**28,083**	**20,582**	**14,093**	**3.2%**	**−5.8%**	**5.8%**	**6.2%**
Low-density polyethylene	7.05	7.19	7,045	7,189	7,793	5,813	4,458	−2.0	−7.8	3.9	4.7
Polystyrene and copolymers	5.69	5.54	5,687	5,540	5,320	4,296	3,748	2.7	4.1	5.8	4.2
Polyvinyl chloride and copolymers	5.66	5.49	5,663	5,485	6,119	4,716	3,471	3.2	−10.4	3.8	5.0
High-density polyethylene	4.95	4.53	4,953	4,531	5,010	3,125	1,928	9.3	−9.6	9.7	9.8
Polypropylene and copolymers	3.95	3.70	3,948	3,699	3,841	2,632	1,288	6.7	−3.7	8.5	11.8
TOTAL[a]	**31.48**	**30.97**	**31,470**	**30,961**	**32,939**	**24,215**	**17,790**	**1.6%**	**−6.0%**	**5.3%**	**5.9%**
SYNTHETIC FIBERS (millions of lb)											
Cellulosics	**0.77**	**0.81**	**771**	**806**	**930**	**751**	**1,391**	**−4.3%**	**−13.3%**	**0.5%**	**−11.2%**
Rayon	0.51	0.49	510	490	606	453	915	4.1	−19.1	2.4	−5.7
Acetate	0.26	0.32	261	316	324	298	476	−17.4	−2.5	−6.2	−5.8
Noncellulosics	**9.03**	**8.73**	**9,026**	**8,741**	**9,433**	**7,291**	**4,761**	**3.3%**	**−7.3%**	**4.4%**	**6.6%**
Polyester	4.18	3.99	4,176	3,989	4,178	3,341	1,831	4.7	−4.5	4.6	8.7
Nylon[b]	2.33	2.36	2,333	2,358	2,721	2,076	1,595	−1.3	−13.3	2.3	3.9
Glass fiber	1.04	0.87	1,041	867	1,014	676	468	20.1	−14.5	8.9	8.4
Olefin	0.79	0.75	785	748	759	577	322	4.9	−1.5	6.3	9.3
Acrylic[c]	0.69	0.78	691	779	761	621	545	−11.3	2.4	2.2	2.4
TOTAL[a]	**9.80**	**9.54**	**9,797**	**9,547**	**10,363**	**8,042**	**6,152**	**2.6%**	**−7.9%**	**4.0%**	**4.7%**
SYNTHETIC RUBBER (thousands of metric tons)											
Styrene-butadiene[d]	2.27	2.37	1,032	1,074	1,378	1,333	1,416	−3.9	−22.1	−4.9	−3.1
Polybutadiene	0.75	0.69	342	311	397	352	254	9.9	−21.7	−0.6	3.0
Ethylene-propylene	0.39	0.32	178	144	175	130	60	23.6	−17.7	6.4	11.5
Butyl	0.37	0.37	168	168	194	125	106	nc	−13.4	6.1	4.7
Neoprene	0.32	0.33	143	151	183	165	e	−5.3	−17.5	−2.8	e
Nitrile	0.17	0.15	75	70	75	73	65	7.1	−6.7	0.5	1.4
Polyisoprene	0.11	0.11	52	50	69	74	117	4.0	−27.5	−6.8	−7.8
Other[f]	0.09	0.11	40	50	66	51	222	−20.0	−24.2	−4.7	e
TOTAL[a]	**4.47**	**4.45**	**2,030**	**2,018**	**2,537**	**2,303**	**2,240**	**0.6%**	**−20.5%**	**−1.6%**	**−0.5%**

a Totals are for those products listed. Totals may not add because of rounding. b Includes aramid. c Includes modacrylic. d Excludes high-styrene latex. e Data for neoprene and "other" are combined for 1971. f Includes chlorosulfonated polyethylene, polyisobutylene, and acrylic, fluoro, polysulfide, and silicone elastomers. nc = no change. **Sources:** Society of the Plastics Industry, Textile Economics Bureau, Rubber Manufacturers Association

ample, production of ammonium nitrate, ammonia, and phosphoric acid—all tied to fertilizer, which took a turn for the worse last year after a healthy 1980—fell last year, although urea output continued strong. In 1980, all four chemicals had shown strong growth as fertilizer use boomed both in the U.S. and in exports.

If 1981 production figures are compared with initial 1980 data in last year's Top 50 (C&EN, May 4, 1981, page 35), the chemical output picture changes, but only superficially. Total 1981 production, for example, would have been up 0.9%, with organics up 0.8% and inorganics up 0.9%. However, initial government data are not always accurate and usually lead to revisions.

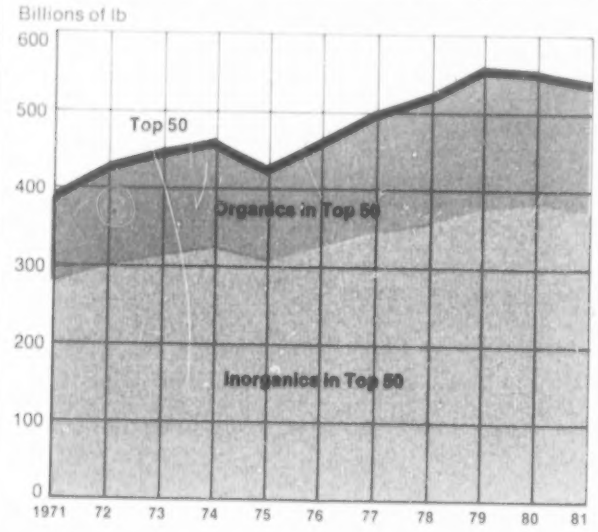
Indeed, some people enjoy taking potshots at government data. But agencies reply that they report only the information that individual companies supply them. The upshot is that revisions and other changes are probably an inherent part of the system, for monthly reports in particular.

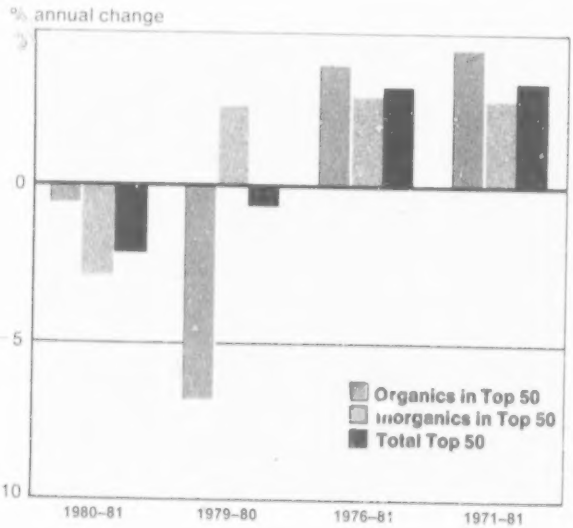
Unfortunately, some bureaucrats contend that the quality of data being submitted is declining. This is far more troublesome than mere tardiness. Some agency officials say that many companies are giving the responsibility of government reporting to increasingly inexperienced nontechnical people who don't know the difference between forms, let alone between chemicals.

The result? Data are entered on wrong lines on the forms, entered with incorrect units, or not entered at all. Government officials can tick off cases of a company market researcher calling to protest the published data on a particular product, only to learn with chagrin that it was the same company's government reporting unit that supplied incorrect data.

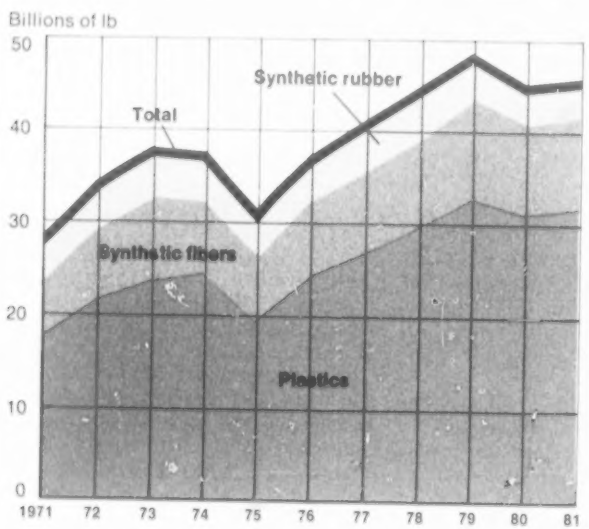
All this can lead to sizable errors in

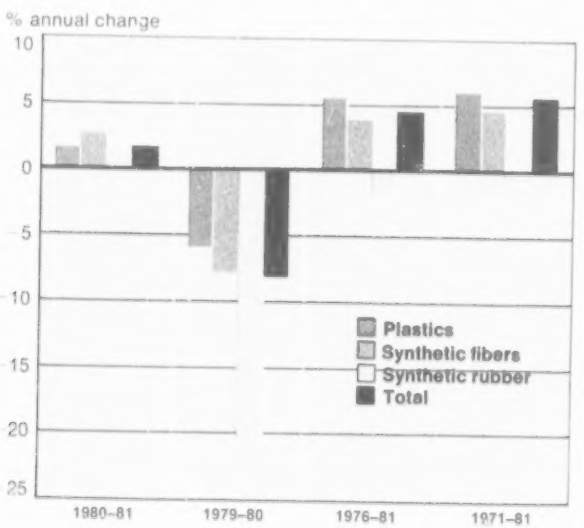
Production of basic chemicals fell again in 1981...





...although polymers made a slight recovery from a bad 1980





reporting, which subsequently must be corrected in revisions. Sometimes, the revisions can be drastic. For example, 1980 preliminary data for benzene showed production of about 1.50 billion gal, but it was later revised to 2.01 billion gal. Preliminary production for toluene was given as 1.56 billion gal, but revised to 1.02 billion gal. By contrast, production of cyclohexane was pegged at 1.97 billion lb in preliminary reporting and at 1.96 billion lb in the revised data.

For polymers, the 1980 and 1981 data picture is clearer. Interestingly, data here are not handled by the government but by industry associations. Although collection of polymer statistics is more efficient and accurate than are the government data, industry sources are quick to point out that polymer categories are far fewer, with fewer producers to keep track of.

Even with revised figures, 1981 production and consumption for plastics and synthetic fibers clearly picked up, and the beleaguered synthetic rubber industry reported modest growth.

Synthetic fibers did best. A rebound in noncellulosic-fibers production pulled up the overall category 2.6% in 1981. Cellulosics, however, still showed a 4.3% decline in output, although that was an improvement from the 13.3% loss in 1980.

Similarly, a 1981 upturn in thermoplastic resins output of 3.2% lifted the entire plastics category 1.6%, even though the smaller segment of thermoset resins declined 7.6% from 1980 production.

Synthetic rubber production rose 0.6% in 1981, spurred primarily by a 23.6% boost in production of ethylenepropylene-diene monomer. Weakness still showed, however, with styrene-butadiene and neoprene. And butyl rubber showed no change from 1980 production. □

Top chemical companies had a rough year

William J. Storck
C&EN, New York

C&EN's Top 50 Chemical Producers

In many ways, 1981 was a year that, financially speaking, U.S. chemical companies would like to forget. Prices were up, but production and demand were down from the year before. Before year's end, markets sagged again from renewed recession.

Thanks to some price increases, the 50 largest U.S. chemical producers (ranked by chemical sales) were able to make a 7.6% gain in chemical sales to a total of almost $114 billion in 1981. Although U.S. chemical production was falling, the average chemicals and allied products price index from the Commerce Department was up 10.7% in 1981 from 1980. Hence, 1981 was the second year in a row that chemical dollar sales increased while production fell.

But even though sales were up in 1981, operating profits were not. For the 45 companies in the Top 50 that reported operating profits for their chemical businesses in 1981, the total fell 8.4% from 1980 to $8.28 billion. Operating profits are pretax, preinterest cost, and precorporate overhead. This means that the chemical operating profit margin for those 45 companies dropped to 7.7% in 1981 from 9.0% in 1980.

Although profits were slumping, companies still were putting more money into their chemical operations. Chemical assets, for the 46 companies that reported them, grew an average of 8.3% to $86.2 billion from 1980. But once again, rising assets and falling operating profits took their toll on chemical profitability. The operating return on chemical assets decreased in 1981 to 8.4% from 11.5% in 1980.

All but one of the companies on C&EN's Top 50 producers list for 1981 were repeaters from 1980. The only addition this year is Sun Co., which has been omitted in past tallies for lack of data. Sun, which ranked 46th in 1981, would have been 47th if it had been included in 1980's list.

Sun has replaced Texasgulf on the list this year. Texasgulf, acquired last year by the French company Société Nationale Elf Aquitaine, no longer publishes sales figures at all. If it did, it undoubtedly would qualify for the Top 50. Other companies would be listed if they divulged pure chemical sales. Among these are Goodyear and ICI Americas.

In spite of the modest increase in total Top 50 sales in 1981, some companies managed to rise considerably above the average.

The largest sales increase was at American Hoechst—24.1% to $1.39 billion. This propelled the U.S. arm of West Germany's Hoechst to 26th place on the list from 33rd in 1980, the biggest leap in rank for any of the 50 companies.

Mobil was another company with good chemical sales growth last year, up 23.0% to almost $2.33 billion. However, its operating profits for chemicals, struck by hard times in the petrochemicals and plastics industries, dropped 30.3% to $122 million. Likewise, Atlantic Richfield had a 21.7% increase in chemical sales in 1981 to $2.74 billion, but chemical operating profits fell 88% to $16 million.

The largest company in the Top 50, Du Pont, also performed well ahead of the average in 1981. Its chemical sales were $12.2 billion, a 14.1% increase over 1980. Operating profit from chemical operations also rose healthily—15.8% to $1.16 billion. Part of this increase is due to the inclusion of acquired Conoco's chemical operations in the latter part of the year. But another influence was a stabilizing in fibers markets during 1981.

Another company that benefited from the stabilized fiber markets is Celanese, whose 1981 sales increased 15.0% to $3.69 billion while chemical operating profits went up 21.5%.

One market, fertilizer, that helped many companies in 1980, hurt them in 1981. For example, chemical sales at CF Industries dropped 14.5% in 1981 to $1.05 billion, while chemical operating profits fell 66.1% to $81 million. The same situation hit Williams Cos. at its big Agrico Chemical operation. Williams' chemical sales

About the Top 50 chemical producers

This year, there is a revised format for the Top 50 U.S. chemical producers. The new presentation goes into much more detail on performance of purely chemical operations, enabled by product-line financial breakdowns given in the companies' reports to their stockholders.

Besides breaking out chemical sales for the companies, the Top 50 compilation now identifies chemical operating profits and chemical assets, plus rates of chemical return. In the past, chemical sales had been sought out but conventional total company data had been used for the other measures.

To expand on performance in chemicals, however, the Top 50 report now is less precise for some companies in the exact makeup of chemical operations. Many firms include some nonchemical operations with chemicals in their product-line financial data. In the past, wherever possible, these nonchemical units were eliminated from the chemical sales figure.

Profitability can mean several things. These measures include:

- Operating profit—sales minus selling and administrative expenses and the cost of goods.
- Operating profit margin—operating profit as a percentage of sales.
- Identifiable chemical assets—tangible assets associated with the production of chemicals within a company. In cases in which the company may have 100% chemical sales and profits, C&EN has, where possible, eliminated corporate assets not associated with production. In this way, chemical assets will not equal 100% of total assets in most instances.
- Return on chemical assets—chemical operating profit as a percentage of identifiable chemical assets.

More than half of Top 50 chemical makers had earnings drops last year

Rank 1981	Rank 1980[a]	Company	Chemical sales 1981 ($ millions)	Change from 1980	Chemical sales as % of total sales	Industry classification	Chemical operating profits[b]	Change from 1980	Chemical operating profits as % of total operating profits	Operating profit margin[c]	Identifiable chemical assets	Chemical assets % of total assets	Operating return on chemical assets[d]
1	1	Du Pont	$12,189	14.1%	53.4%	Basic chemicals	$1155	15.8%	40.5%	9.5%	$8268	37.9%	14.0%
2	2	Dow Chemical	9,387[e]	7.7	79.3	Basic chemicals	612	−37.0	66.8	6.5	8636	69.1	7.1
3	3	Exxon	8,449	2.7	7.5	Petroleum	271	−32.6	5.0	3.2	4937	7.8	5.5
4	4	Monsanto	6,311[e]	5.5	90.8	Basic chemicals	672	273.3	90.8	10.6	5224	86.1	12.9
5	5	Union Carbide	5,575	6.9	54.3	Basic chemicals	580	−12.3	39.3	10.4	6008	65.4	9.7
6	6	Celanese	3,691	15.0	93.4	Basic chemicals	198	21.5	90.0	5.4	2450	81.9	8.1
7	7	Shell Oil	3,578	12.8	16.5	Petroleum	15	−91.4	0.4	0.4	3462	18.8	0.4
8	8	Standard Oil (Ind.)	3,088	7.6	9.7	Petroleum	210	−24.2	5.5	6.8	3792	12.3	7.6
9	13	Atlantic Richfield	2,739	21.7	9.7	Petroleum	16	−88.0	0.5	0.6	2728	13.8	0.6
10	9	W. R. Grace	2,666	−1.1	41.9	Specialty chemicals	379	−1.0	47.2	14.2	1721	35.9	22.0
11	10	Allied	2,653	8.3	41.4	Basic chemicals	189	2.2	17.6	7.1	1810	33.9	10.4
12	14	Phillips Petroleum	2,470	9.8	15.5	Petroleum	140	−13.6	5.1	5.7	1544	16.1	9.1
13	11	Gulf Oil	2,412	−1.1	8.0	Petroleum	−59	def	def	def	1701	8.3	def
14	12	Occidental Petroleum	2,406	−0.8	15.7	Petroleum	108	−15.0	4.8	4.5	1922	25.9	5.6
15	16	Eastman Kodak	2,349	13.5	22.7	Photo equipment	289	−8.8	14.0	12.3	1680	17.8	17.2
16	17	Mobil	2,325	23.0	3.4	Petroleum	122	−30.3	2.0	5.2	1797	5.2	6.8
17	15	Hercules	2,273	8.5	83.6	Basic chemicals	170	28.8	94.4	7.5	1534	91.5	11.1
18	18	American Cyanamid	1,945[e]	4.5	53.3	Basic chemicals	198	10.0	56.1	10.2	1488	60.1	13.3
19	20	Rohm & Haas	1,761	9.5	93.4	Basic chemicals	187	−3.6	106.9	10.6	1109	97.9	16.9
20	19	Stauffer Chemical	1,726	1.8	100.0	Basic chemicals	261	34.5	100.0	15.1	1638	80.5	15.9
21	21	Tenneco	1,589	−3.1	10.3	Petroleum	36	−58.1	1.9	2.3	1244	7.4	2.9
22	25	Texaco	1,525	13.3	2.6	Petroleum	143	11.7	2.3	9.4	1062	3.9	13.5
23	23	Ethyl Corp.	1,515[e]	−0.1	86.2	Basic chemicals	154	0.7	85.6	10.2	958	75.9	16.1
24	24	U.S. Steel	1,427	−0.7	10.2	Steel	11	−84.5	1.6	0.8	727	5.5	1.5
25	22	Borden	1,424[e]	−8.0	32.3	Dairy products	141	−22.5	45.8	9.9	1144	49.2	12.3
26	33	American Hoechst	1,391	24.1	86.5	Basic chemicals	na	na	na	na	na	na	na
27	28	FMC	1,383	13.5	41.1	Machinery	195	72.6	62.7	14.1	1114	40.7	17.5
28	26	Air Products[f]	1,362	7.9	86.8	Basic chemicals	204	4.6	87.2	15.0	1499	79.9	13.6
29	32	International Minerals[g]	1,347	17.7	48.6	Agri. chemicals	254	−4.9	78.4	18.9	1384	70.1	18.4
30	34	Ashland Oil	1,330	20.8	13.7	Petroleum	41	−30.5	23.0	3.1	463	11.3	8.9
31	29	Ciba-Geigy	1,297	9.7	69.7	Specialty chemicals	na	na	na	na	na	na	na
32	37	Mobay Chemical	1,270	18.8	100.0	Basic chemicals	na	na	100.0	na	1303	100.0	na
33	36	Union Oil of Calif.	1,248	14.8	11.0	Petroleum	111[h]	6.7	14.0	8.9	701	9.2	15.8
34	31	Standard Oil of Calif.	1,219	5.5	2.7	Petroleum	31[h]	−8.8	1.3	2.5	917	3.9	3.4
35	35	Diamond Shamrock	1,152	4.9	34.1	Basic chemicals	150	32.7	40.7	13.0	1075	35.6	14.0
36	41	Olin	1,077	16.6	53.8	Basic chemicals	80	27.0	44.2	7.4	947	60.9	8.4
37	27	CF Industries	1,054[e]	−14.5	100.0	Agri. chemicals	81	−66.1	100.0	7.7	1133	100.0	7.1
38	38	B. F. Goodrich	1,050	2.7	33.0	Rubber products	48	−20.0	43.6	4.6	1261	46.7	3.8
39	39	PPG Industries	1,012	5.0	30.2	Glass products	120	−16.7	31.9	11.9	1004	34.0	15.8
40	30	Williams Cos.	985[e]	−15.9	49.8	Agri. chemicals	35	−80.1	22.9	3.6	1018	41.6	3.4
41	40	BASF Wyandotte	967	5.3	100.0	Basic chemicals	24	84.6	100.0	2.5	791	100.0	3.0
42	43	Reichhold Chemicals	950	7.3	100.0	Basic chemicals	35	29.6	100.0	3.7	401	98.0	8.7
43	42	Lubrizol	899	−2.5	100.0	Specialty chemicals	149	−22.0	100.0	16.6	582	86.5	25.6
44	44	National Distillers	823	−1.0	40.0	Alcoholic beverages	134	6.3	71.3	16.3	606	36.1	22.1
45	45	Farmland Industries	816	11.2	14.8	Agricultural supplies	67	−40.7	31.2	8.2	454	24.2	14.8
46	47	Sun Co.	746	12.9	5.0	Petroleum	na	na	na	na	na	na	na
47	47	Georgia-Pacific	738[e]	11.6	13.6	Wood products	149	−2.6	37.6	20.2	947	18.7	15.7
48	46	Dow Corning	722	5.9	100.0	Specialty chemicals	76	2.7	100.0	10.5	787	100.0	9.7
49	50	Nalco Chemical	667	8.1	100.0	Specialty chemicals	122	6.1	100.0	18.3	227	75.1	34.9
50	49	Borg-Warner	664	5.2	24.0	Auto equipment	61	3.4	29.6	9.2	316	22.5	19.3

a Revised. b Operating profit defined as sales less administrative expense and cost of selling. c Operating profit as a percentage of chemical sales. d Operating profit as a percentage of identifiable chemical assets. e Chemical sales include significant amounts of nonchemical products. f Fiscal year ended Sept. 30, 1981. g Fiscal year ended June 30, 1981. h Net income. i Fiscal year ended Aug. 31, 1981. **na** = not available. **def** = deficit.

Different companies lead in profits, assets, and profitability

Rank	Operating profit ($ millions)		Operating profit margin[a]		Chemical assets ($ millions)		Return on chemical assets[b]
1	Du Pont	$1155	Georgia-Pacific	20.2%	Dow Chemical	$8636	Nalco Chemical	34.9%
2	Monsanto	672	International Minerals	18.9	Du Pont	8268	Lubrizol	25.6
3	Dow Chemical	612	Nalco Chemical	18.3	Union Carbide	6008	National Distillers	22.1
4	Union Carbide	580	Lubrizol	16.6	Monsanto	5224	W. R. Grace	22.0
5	W. R. Grace	379	National Distillers	16.3	Exxon	4937	Borg-Warner	19.3
6	Eastman Kodak	289	Stauffer Chemical	15.1	Shell Oil	3791	International Minerals	18.4
7	Exxon	271	Air Products	15.0	Standard Oil (Ind.)	2766	FMC	17.5
8	Stauffer Chemical	261	W. R. Grace	14.2	Atlantic Richfield	2728	Eastman Kodak	17.2
9	International Minerals	254	FMC	14.1	Celanese	2450	Rohm & Haas	16.9
10	Standard Oil (Ind.)	210	Diamond Shamrock	13.0	Occidental Petroleum	1922	Ethyl Corp.	16.1
11	Air Products	204	PPG Industries	11.9	Allied	1810	Air Products	15.9
12	Celanese	198	Monsanto	10.6	W. R. Grace	1721	PPG Industries	15.8
13	American Cyanamid	198	Rohm & Haas	10.6	Gulf Oil	1701	Farmland Industries	14.8
14	FMC	195	Dow Corning	10.5	Eastman Kodak	1680	Du Pont	14.0
15	Allied	189	Union Carbide	10.4	Stauffer Chemical	1638	Diamond Shamrock	14.0

a Chemical operating profit as a percentage of chemical sales. b Chemical operating profit as a percentage of identifiable chemical assets.

fell 15.9% to $985 million and chemical operating profits dropped 80.1% to $35 million.

These sales declines were enough to drop both companies a rugged 10 places in the Top 50 rankings—CF Industries to 37th in 1981 from 27th in 1980 and Williams to 40th last year from 30th the year before.

It must be admitted that chemical producers report their chemical results in different ways. Chemical sales or operating profit at one company may not compare exactly with figures from another. In fact, there are changes within an individual company year-to-year. Thus, the rankings in the Top 50 list are approximate. They should be used as a general guide to the relative performance of the various companies. □

Basic chemical companies as a group outperform others

It may seem logical, but it still needs proof that basic chemical companies know more about making and selling chemicals than do other companies that get into the business.

It certainly seems true from last year's results, in a year when the economy first was becalmed and then beset with recession. True, basic chemical companies were not the best performers in every category, but where they did not lead, they were usually a respectable second.

For comparison, C&EN used 44 of the 50 companies that had fairly consistent reporting. The 44 have similar accounting for chemical sales, chemical operating profits, and chemical assets. The 44 companies had combined chemical sales in 1981 of $107 billion, or 95% of the total for the Top 50. Of the 44, 23 were basic chemical companies with combined chemical sales of $63.4 billion, 59% of total chemical sales of the 44. Eleven were oil companies with sales of $31.9 billion, or 30%. The other 10 companies had chemical sales of $11.7 billion, or 11%.

Chemical sales of the 23 chemical companies and 11 oil companies both increased 8% in 1981 from 1980. For the remaining 10 companies, chemical sales went up a smaller 5%.

It is in operating profits that the 23 chemical companies shine. Their chemical operating profits increased 2% from 1980 to $5.95 billion. The gain wasn't much, but it was far better than the 41% drop in chemical operating profits to $1.04 billion for the oil companies. Chemical earnings for the other 10 declined 9% to $1.22 billion.

The one area in which chemical companies truly lagged last year was asset growth: Chemical assets of the 23 chemical companies grew just 7% in 1981 to $51.3 billion. However, chemical assets of the oil companies increased 9% to $24 billion, and those of the other 10 companies rose 13% to $9.25 billion.

In profitability, the chemical companies came in well ahead of the oil companies and a decent second to the other producers. Average chemical operating profit margin for the 23 chemical firms was 9.4% in 1981, compared to 3.3% for the oil companies, but below 10.4% for the remaining companies.

The same held true for return on assets for chemical operations. For the 23 chemical companies, it was 11.6%, compared to 4.3% for the oil companies and 13.1% for the others.

$ Millions	Chemical sales	Change from 1980	Chemical operating profits	Change from 1980	Chemical profit margin[a]	Chemical assets	Change from 1980	Chemical return on assets[b]
23 chemical companies[c]	$ 63,422	8%	$5947	2%	9.4%	$51,327	7%	11.6%
11 oil companies[c]	31,911	8	1043	−41	3.3	23,995	9%	4.3
10 other	11,686	5	1215	−9	10.4	9,253	13	13.1
TOTAL[c]	**$107,019**	**7%**	**$8205**	**−9%**	**7.7%**	**$84,575**	**8%**	**9.7%**

a Chemical operating profits as a percentage of chemical sales. b Chemical operating profits as a percentage of identifiable chemical assets. c Three chemical companies—Ciba-Geigy, American Hoechst, and Dow Corning—and three oil companies—Standard Oil of California, Union Oil of California, and Sun Co.—have been excluded.

World plastics capacity due up 17% by mid-80s

As the great business plateau starting in 1979 stretches interminably through the early 1980s, it would seem that the last thing one of the most struggling parts of the worldwide chemical industry needs is more plants. But for plastics, that's exactly what's in store—17% more capacity by the mid-1980s, according to a new worldwide study by consultants C. H. Kline of Fairfield, N.J.

Capacity is just one of the subjects of Kline's 715-page, two-volume report on the worldwide plastics industry, which covers more than 600 producers in the noncommunist world. Other highlights:

- Low-density polyethylene finally will become the world's largest-volume resin, passing polyvinyl chloride.
- Dow Chemical ranks number one among more than 600 plastics producers, with BASF and Shell not far behind.
- The U.S. is the leading plastics producer with one third of worldwide capacity. The U.S. also has the most plastics companies with 102.
- The fastest-growing plastic by far will be the new linear low-density polyethylene, which will triple capacity by the mid-1980s.
- Most notable geographic growth in plastics will be in developing countries, whose share of the market will be nearly one fourth by the mid-1980s.

The Kline study pegs known 1981 capacity for 20 leading plastics at a little more than 140 billion lb (63.7 million metric tons). This capacity will bulge 17.4% by the mid-1980s to almost 165 billion lb (74.8 million metric tons).

This growth will center in terms of resins in the polyolefins and geographically in the developing countries. However, there will be great differences in growth rates.

For example, for the two resins now way out in front in capacity—low-density polyethylene and polyvinyl chloride—Kline forecasts that the former will grow twice as fast as the latter. In the process, they will trade places. Kline says that conventional LDPE (not including the new linear grades) still will grow 20.0% in worldwide capacity in the first half of the 1980s to 38.0 billion lb. This will give it top spot, ahead of PVC, which Kline predicts will grow only 8.9% in capacity to 35.3 billion lb.

Among the other top resins, Kline rates the industry's wonder child, linear LDPE, almost at 203% growth over this half-decade to 8.08 billion lb from a starting position of 2.67 billion lb in 1981. The study also gives high-density polyethylene good growth potential with a 26.7% capacity jump to 22.9 billion lb by the mid-1980s. HDPE will keep third place among resins.

Two other products with double-digit growth will be polypropylene and polyurethane-precursor isocyanates. Kline says polypropylene capacity is due up 13.9% by mid-decade to 17.8 billion lb. Polypropylene will hop up from fifth to fourth place. Isocyanates plant capacity will grow 17.4% to 4.27 billion lb.

Losing position in the first half of the 1980s will be the aromatics. The Kline report forecasts some growth for polystyrene capacity, 6.9% to 17.6 billion lb. But polystyrene will drop from fourth to fifth position among resins.

The investment trend for these resins will be in developing countries. Plastics capacity outside the 10 leading industrial countries will grow 69% in just half a decade, according to Kline's data.

Among the 10 leading countries, the U.S. had about 40 billion lb of plastics capacity in 1981. Japan was second with more than 15 billion lb, and West Germany third with more than 11 billion lb. □

Dow Chemical is world's leading plastics producer

Known capacity 1981 (millions of lb per year)[a]	Major thermoplastics[b]	Other plastics[c]	Total
Dow Chemical	6338	1566	7904
BASF	6024	1573	7597
Shell	6932	486	7418
ICI	6030	653	6683
Hoechst	6259	132	6391
Union Carbide	4840	471	5311
Montedison	3410	1019	4429
Solvay	4356	—	4356
Du Pont	2794	968	3762
British Petroleum	3302	209	3511
Monsanto	1896	1107	3003
CdF Chimie	2772	150	2922
B. F. Goodrich	2895	—	2895
Mitsubishi	2572	291	2863
Bayer	660	2198	2858
Exxon	2585	—	2585
Phillips Petroleum	1962	271	2233
Huels	2121	68	2189
National Distillers	2013	—	2013
DSM	1892	88	1980

a Most companies also have unknown capacities in smaller-volume plastics. b Low-density polyethylene, high-density polyethylene, polypropylene, polystyrene, and polyvinyl chloride. c Includes polyurethane chemicals. **Source:** C. H. Kline consultants

Largest-volume plastic in the world by middle of decade will be low-density polyethylene

Rank Mid-1980s	Rank 1981	Resin	Capacity, millions of lb per year Mid-1980s	1981	Change
1	2	**Polyethylene, low-density**	38,047	31,702	20.0%
2	1	**Polyvinyl chloride**	35,339	32,430	8.9
3	3	**Polyethylene, high-density**	22,895	18,071	26.7
4	5	**Polypropylene**	17,809	15,631	13.9
5	4	**Polystyrene**	17,626	16,491	6.9
6	10	**Polyethylene, linear low-density**	8,081	2,669	202.8
7	6	**Acrylonitrile-butadiene-styrene**	4,662	4,374	6.6
8	8	**Isocyanates**[a]	4,270	3,634	17.4
9	7	**Polyols**[a]	4,255	4,246	0.2
10	9	**Unsaturated polyesters**	3,538	3,516	0.6
		Other[b]	8,006	7,359	8.8
		TOTAL	**164,528**	**140,123**	**17.4%**

a Used as indicators for derivative polyurethanes. b Includes acrylics, amino resins, cellulosics, fluoropolymers, phenolics, polyacetals, polycarbonates, polyphenylene oxide, styrene-acrylonitrile. **Source:** C. H. Kline consultants